

# 1.1 Problem Solving

M. Goodroe - Quantitative Skills and Reasoning

## Objectives:

1. Use Polya's method to solve problems.
2. State and apply fundamental problem-solving strategies.
3. Apply basic mathematical principles to problemsolving
4. Use the *Three-Way Principle* to learn mathematical ideas.

## *Problem-Solving Strategies:*

1. Polya's Method
2. Draw Pictures
3. Choose Good Names for Unknowns
4. Be Systematic
5. Look for Patterns
6. Try a Simpler Version of the Problem
7. Guess
8. Relate a New Problem to an Older Problem

## *Key Principles:*

- The Always Principle
- The Counterexample Principle
- The Order Principle
- The Splitting-Hairs Principle
- The Analogies Principle
- The Three-Way Principle

Name: \_\_\_\_\_

**SHORT ANSWER.** Write the word or phrase that best completes each statement or answers the question.

**Draw a picture to illustrate the situation.**

- 1) At Moira's birthday party, each guest has a choice of chocolate, strawberry, or banana topping on vanilla ice cream.

**Decide which set of names would be most meaningful for the indicated items.**

- 2) A fish tank is 3 times as long as it is wide, and has a volume of 22 gallons.

**List the items mentioned. Try to organize your list in a systematic way.**

- 3) A frozen yogurt stand has chocolate and vanilla yogurt. For toppings it has nuts, coconut syrup, or candy pieces. List all combinations that use one flavor and one topping.

- 4) A coin is flipped and a 6-sided number cube is rolled. Use H for heads and T for tails, and list all possible outcomes.

**Continue the pattern for five more items in the list.**

- 5) 7, 10, 13, 16, ...

- 6) aaa, aab, aba, ...

**Solve the problem by guessing and adjusting.**

- 7) Ramon spent twice as long on his English homework as he did on his History homework. If he spent 60 minutes on the two combined, then how long did he spend on his History homework?
- 8) Corinne is making a beaded necklace. She has 3 times as many green beads as red beads, and twice as many blue beads as green beads. If she has 150 beads all together, how many of the beads are blue?

**Decide whether the two sequences of operations give the same result. Explain your choice.**

- 9) Squaring a number, then multiplying it by 5; multiplying a number by 5 and then squaring the product
- 10) Dividing  $r$  by 5, then dividing  $s$  by 5, then multiplying the quotients; multiplying  $r$  and  $s$ , then dividing by 5.